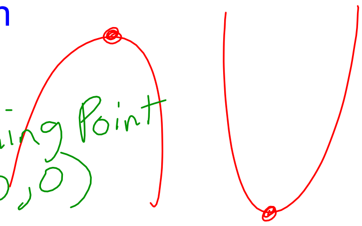
3/27/18 "A mistake is food for a new invention." -Anonymous

HW: "Vertical Streching of Functions" homework section

AIM: How do we stretch functions vertically?

Warm Up:



turning point

$f(x) = x^2$

Turning Point (0,0)

What is the vertex of $f(x) = -2.5(x-4)^2 - 18$?

multiply y-values by -2.5

add 4 to x values

subtract 18 from y-values

$f(x) = x^2$ has turning point of (0,0)

$+4$

(4,0)

$\times(-2.5)$

(4,0)

-18

$\boxed{(4,-18)}$

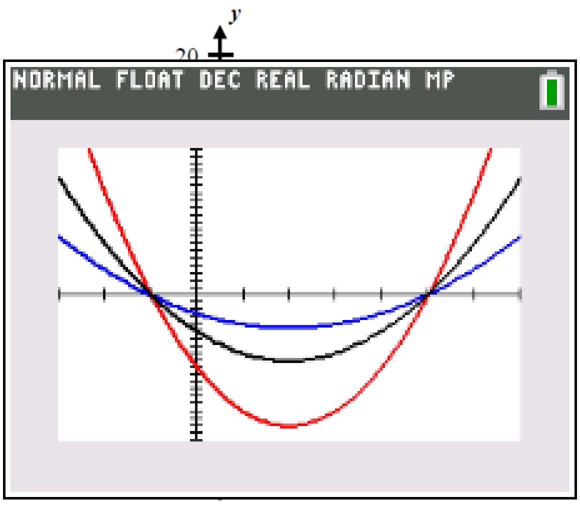
***Exercise* #1:** Consider the quadratic function $f(x)=x^2-4x-5$. The quadratic functions g and h are defined by the formulas $g(x)=2f(x)$ and $h(x)=\frac{1}{2}f(x)$

$g(x)=2(x^2-4x-5)$ $h(x)=\frac{1}{2}(x^2-4x-5)$

(a) Determine formulas for both g and h in simplest trinomial form.

$g(x)=2x^2-8x-10$ $h(x)=\frac{1}{2}x^2-2x-\frac{5}{2}$

(b) Using your calculator, sketch and label each curve on the set of axes below. Use the window indicated by the axes.



(c) Using the **MINIMUM** command on your calculator, determine the minimum value for each function.

$f_{min}= -9$

$g_{min}= -18$

$h_{min}= -4.5$

(d) What points did not vary when f was vertically dilated by factors of 2 and **1/2**? Explain why this happened.

The zeros did not change

0 times anything is still 0.

VERTICAL DILATIONS OF FUNCTIONS

The function $h(x)=k\cdot f(x)$ represents a vertical stretch of the function $f(x)$ if $k>1$ and a vertical compression of the function $f(x)$ if $0<k<1$.

(Shrink)

***Exercise* #2:** If the point $(-3,12)$ lies on the graph of the function $y=f(x)$ which of the following points *must* lie on the graph of $y=3f(x)$?

outside
so multiply y-values by 3

$12\times 3=36$

~~(1) $(-9,36)$~~

$\boxed{(2)\ (-3,36)}$

(3) $(-3,4)$

~~(4) $(-9,12)$~~

***Exercise* #3:** The graph of $y=f(x)$ is shown below. Consider the function $y=g(x)$ defined by $g(x)=2f(x)-3$.

(*) Use PEMDAS

(a) What two transformations have occurred to the graph of *f* in order to produce the graph of *g*? Specify both the transformations and their order.

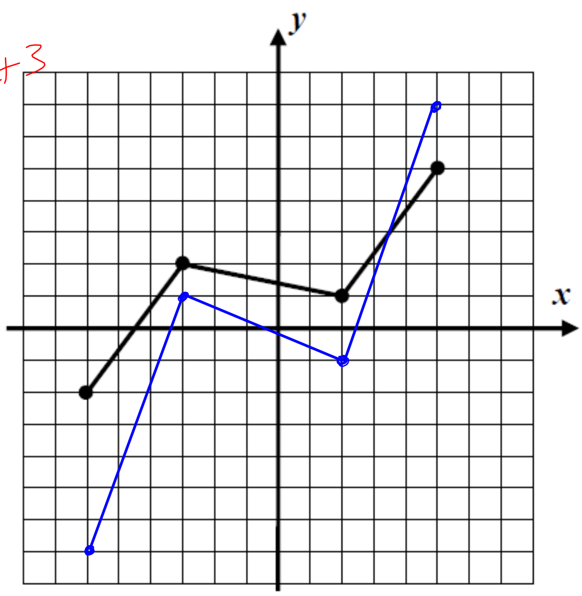
1) Vertical Stretch by a factor of 2.

2) Shift down 3

(b) Graph and label $y=g(x)$

multiply y-values by 2 then subtract 3

$f(x)$	$g(x)$
$(-6,-2)$	$(-6,-7)$
$(-3,2)$	$(-3,1)$
$(2,1)$	$(2,-1)$
$(5,5)$	$(5,7)$



y-value

***Exercise* #4:** The function $h(x)$ has a range given by the interval $[2,10]$. The function $f(x)$ is defined by $f(x)=\frac{3}{2}h(x)+8$. Which of the following gives the range of $f(x)$?

(1) $[11, 23]$ (3) $[15, 27]$

(2) $[8, 12]$ (4) $[6, 32]$

$[2, 10]$
$\times\ 3/2 \quad 3/2$
$[3, 15]$
$+8 \quad +8$
$[11, 23]$

***Exercise* #5:** If the quadratic function $g(x)$ has a y-intercept of 12, which of the following is true about the function $h(x)=3g(x)-5$?

(1) It has a y-intercept of -5.
(2) It has a y-intercept of 21.
(3) ~~It has a y-intercept of -15.~~
(4) It has a y-intercept of 31.

$\times 3$
36
-5
31